are given an undirected graph and an

9. You have executed the following shared C code to count 1000 numbers by ÷ 6.0

10. In Data Structures, which of the following statements about the worst- ÷ 2.0

2 Programming questions

11. Character set count ÷ 100.0

12. Paired XOR sums ÷ 100.0

Question 12 Max. score: 100.00

Paired XOR sums

You are given the following:

- Two integers *N* and *K*
- An array *arr* of *N* integers [arr_1, arr_2, arr_3,..., arr_N]

A function *f(x, y)* is defined as:

$$f(x,y) = (x \oplus arr_1) \,\&\, (y \oplus arr_1) + (x \oplus arr_2) \,\&\, (y \oplus arr_2) + \ldots (x \oplus arr_N) \,\&\, (y \oplus arr_N)$$

Task

Determine two distinct integers *(x,y)* less than 2^K such that the value of *f(x, y)* is maximum. Print the maximum value.

Note

1. Consider 1-based indexing.
2. A *bitwise XOR* ($\oplus$) is a binary operation that takes two-bit patterns of equal length and performs the logical exclusive OR operation on each pair of corresponding bits. The result in each position is *1* if only one of the bits is *1*, but will be *0* if both are *0* or both are *1*.
3. A *bitwise AND* ($\&$) is a binary operation that takes two-bit patterns of equal length and performs the logical AND operation on each pair of corresponding bits. The result in each position is *1* if both the bits are *1*, but will be *0* in all other cases.

Example

Assumptions

- *T = 1*
- *N = 4*
- *K = 3*
- *arr = [1, 6, 5, 7]*

Approach

- You can easily verify by taking *(x, y)* = (0, 1), you get the maximum value of *f(x, y)* = 16. Using any other combination, you always get a lower value of *f(x, y)*. Hence, the answer is *16*.

Function description

Complete the *maxXORsum* function provided in the editor. This function takes the following *3* parameters and returns the maximum value of *f(x, y)*:

- *N*: Represents the size of array *arr*
- *K*: Represents an integer
- *arr*: Represents an array of size *N*

Input format

Note: This is the input format that you must use to provide custom input (available above the **Compile and Test** button).

- The first line contains a single integer *T* that denotes the number of test cases. *T* also denotes the number of times you have to run the *maxXORsum* function on a different set of inputs.
- For each test case:
  - The first line contains *2* space-separated integers *N* and *K*.
  - The next line contains *N* space-separated integers denoting the array *arr*.

Output format

For each test case, print the output in a new line.

Constraints

$1 \leq T \leq 20$

$1 \leq N \leq 2^{17}$

$1 \leq K \leq 30$

$0 \leq a_i < 2^K$

Code snippets (also called starter code/boilerplate code)

This question has code snippets for C, CPP, Java, and Python.

Sample input 1

Copy

```
2
3 4
7 5 5
3 3
0 0 0
```

Sample output 1

Copy

```
40
18
```

Explanation

The first line represents the number of test cases, *T* = 2

For test case 1

Given

- *N = 3*
- *K = 4*
- *arr = [7, 5, 5]*

Approach

- Taking *x* = 10 and *y* = 11, you obtain the maximum value of *40*.
- $f(10, 11) = (10 \oplus 7)\ \&\ (11 \oplus 7) + (10 \oplus 5)\ \&\ (11 \oplus 5) + (10 \oplus 5)\ \&\ (11 \oplus 5)$
- $=> f(10, 11) = 12 + 14 + 14 = 40$

Therefore, the answer is *40*.

For test case 2

Given

- *N = 3*
- *K = 3*
- *arr = [0, 0, 0]*

Approach

- Taking *x* = 6 and *y* = 7, you obtain the maximal value of 18.
- $f(6, 7) = (6 \oplus 0)\ \&\ (7 \oplus 0) + (6 \oplus 0)\ \&\ (7 \oplus 0) + (6 \oplus 0)\ \&\ (7 \oplus 0)$
- $=> f(6, 7) = 6 + 6 + 6 = 18$

Therefore, the answer is *18*.

Note: Your code must be able to print the sample output from the provided sample input. However, your code is run against multiple hidden test cases. Therefore, your code must pass these hidden test cases to solve the problem statement.

Time Limit: 2.0 sec(s) for each input file
Memory Limit: 256 MB
Source Limit: 1024 KB
Marking Scheme: Score is assigned if any testcase passes
Allowed Languages: C++, C++14, C++17, Python, Python 3, Python 3.8

New Submission | All Submissions

Save | C++ (g++ 5.4.0) | Full Screen

```
1  #include<bits/stdc++.h>
2  using namespace std;
3
```

```cpp
long long maxXORsum (int N, int K, vector<int> arr) {
    // Write your code here

}

int main() {

    ios::sync_with_stdio(0);
    cin.tie(0);
    int T;
    cin >> T;
    for(int t_i = 0; t_i < T; t_i++)
    {
        int N;
        cin >> N;
        int K;
        cin >> K;
        vector<int> arr(N);
        for(int i_arr = 0; i_arr < N; i_arr++)
        {
            cin >> arr[i_arr];
        }

```

1:1 vscode

Provide custom input

COMPILE & TEST SUBMIT